The Biological Basis of Sex Differences in Athletic Performance: Consensus Statement for the American College of Sports Medicine

**Main conclusions**

1. Biological sex is a primary determinant of athletic performance and physical tasks because of fundamental sex differences in anatomy and physiology dictated by sex chromosomes.

2. Before puberty, sex differences in athletic performance are minimal. Large differences emerge at puberty (~12 years) due to the anabolic effects of testosterone in males. Testosterone levels rise ~20-30 fold in males during puberty and are 15 times higher in males than females by age 18.

3. Direct and indirect effects of testosterone during male puberty include increased skeletal muscle mass due to larger muscle fiber cross-sectional area, especially fast, type II MHC fibers; lower percentage body fat; higher hemoglobin concentration and mass; larger ventricular mass and myocardial contractility; larger airways and lungs; greater body height; and longer limbs.

4. Adult males are stronger, more powerful, and faster than females of similar age and training status. The sex difference in athletic performance where endurance or muscular power is required is roughly 10-30%.

5. Past and present studies of athletic performance, acute exercise, and exercise training involve the testing of more males than females, or fail to distinguish between the sexes. Consequently, less is known about the physiology of female athletes, the limits of their athletic abilities, and the acute and adaptive response of females to exercise and training.

*More resources can be found at acsm.org/sd.*